

## **CHAPTER 5**

### **PIERRE, SOUTH DAKOTA**

[THIS PAGE INTENTIONALLY LEFT BLANK]

**CHAPTER 5  
PIERRE, SOUTH DAKOTA**

**TABLE OF CONTENTS**

5.1	ALTERNATIVES CONSIDERED .....	5-3
5.2	COMPARISON OF IMPACTS .....	5-5
5.2.1	Climate .....	5-6
5.2.2	Topography .....	5-6
5.2.3	Geology and Soils .....	5-7
5.2.4	Paleontological Resources .....	5-10
5.2.5	Land Use .....	5-11
5.2.5.1	Agriculture .....	5-11
5.2.5.2	Residential .....	5-13
5.2.5.3	Business and Industrial .....	5-15
5.2.5.4	Public Facilities .....	5-16
5.2.6	Water Resources .....	5-19
5.2.6.1	Surface Water Impacts .....	5-19
5.2.6.2	Wetlands .....	5-22
5.2.6.3	Groundwater .....	5-25
5.2.7	Air Quality .....	5-25
5.2.8	Noise and Vibration .....	5-27
5.2.8.1	Noise .....	5-28
5.2.8.2	Vibration .....	5-30
5.2.9	Biological Resources .....	5-31
5.2.9.1	Vegetation .....	5-32
5.2.9.2	Wildlife .....	5-33
5.2.9.3	Aquatic and Fisheries .....	5-35
5.2.9.4	Endangered, Threatened, and Sensitive Species .....	5-36
5.2.10	Transportation .....	5-39
5.2.11	Safety .....	5-42
5.2.12	Hazardous Material .....	5-47
5.2.13	Energy Resources .....	5-51
5.2.14	Cultural Resources .....	5-51
5.2.15	Socioeconomics .....	5-58
5.2.16	Environmental Justice .....	5-62
5.2.17	Recreation .....	5-64
5.2.18	Aesthetics .....	5-67
5.3	SEA's RECOMMENDATIONS .....	5-69

## LIST OF TABLES

<b><u>Table Number</u></b>		<b><u>Page</u></b>
5-1	Comparison of Palustrine Wetlands for the Pierre/Fort Pierre Alternatives, South Dakota .....	5-23
5-2	Air Emissions and Gross-ton Miles for 20, 50, and 100 MNT of Coal Transport Pierre/Fort Pierre Alternatives .....	5-26
5-3	Noise Sensitive Receptors Exposed to Noise Levels of 65 and 70 dBA $L_{dn}$ for Pierre Alternatives .....	5-28
5-4	Structures within 400 feet of the Pierre/Fort Pierre Alternatives .....	5-31
5-5	Areas of Potential Environmental Concern along Alternative P-3 .....	5-50
5-6	Known Archaeological Sites in or Adjacent to the Existing DM&E Rail Line Right-of-Way through Pierre and Fort Pierre .....	5-52
5-7	Historic Structures Within the Right-of-Way of Alternative P-2 .....	5-54
5-8	Known Archaeological Sites Within One Mile of Alternative P-3 .....	5-56

## LIST OF FIGURES

<b><u>Figure Number</u></b>		<b><u>Following Page</u></b>
5-1	Pierre/Fort Pierre Bypass Alternative Routes - Pierre, South Dakota .....	5-3
5-2	Existing DM&E Rail Line - Hughes County, South Dakota - Antelope Island, Rousseau Quads .....	5-4
5-3	Proposed Pierre Bypass - Hughes County, South Dakota - Antelope Island Quad .....	5-4



5-4	Existing DM&E Rail Line - Hughes County, South Dakota - Pierre, Antelope Island Quad . . . . .	5-4
5-5	Existing DM&E Rail Line - Hughes County, South Dakota - Pierre Quad . . . .	5-4
5-6	Existing DM&E Rail Line - Hughes and Stanley Counties, SD Oahe Dam, Pierre NE, Pierre SW, Pierre Quads . . . . .	5-4
5-7	Existing DM&E Rail Line - Stanley County, South Dakota - Pierre SW, Pierre Quads . . . . .	5-4
5-8	Existing DM&E Rail Line - Stanley County, South Dakota - Pierre SW, Pierre Quads . . . . .	5-4
5-9	Existing DM&E Rail Line - Hughes County, South Dakota - Antelope Island, Rousseau Quads . . . . .	5-4
5-10	Proposed Pierre Bypass - Hughes County, South Dakota - Antelope Island Quads . . . . .	5-4
5-11	Proposed Pierre Bypass - Stanley County, South Dakota - Antelope Island, Rousseau Quads . . . . .	5-4
5-12	Proposed Pierre Bypass - Stanley County, South Dakota - Antelope Island Quads . . . . .	5-4
5-13	Proposed Pierre Bypass - Stanley County, South Dakota - Pierre, Antelope Island Quads . . . . .	5-4
5-14	Proposed Pierre Bypass - Stanley County, South Dakota - Pierre Quad . . . . .	5-4
5-15	Proposed Pierre Bypass - Stanley County, South Dakota - Pierre SW, Pierre Quads . . . . .	5-4

\* \* \* \* \*

[THIS PAGE INTENTIONALLY LEFT BLANK]

## CHAPTER 5

### PIERRE, SOUTH DAKOTA

As part of the proposed Powder River Basin (PRB) Expansion Project, DM&E indicated to the Board that it intended to rehabilitate its entire existing rail line to enable safe and efficient transport of unit coal trains. This rehabilitation originally included the portion of DM&E's existing rail line through the communities of Pierre and Fort Pierre, South Dakota, as well as the existing rail bridge over the Missouri River between the two communities. DM&E subsequently determined that rehabilitation of its existing 0.3-mile Missouri River bridge may not be feasible and that construction of a new bridge immediately adjacent to the existing bridge may be required.

In a Notice to the Parties issued on April 20, 1999, the Board provided the opportunity for communities to submit proposals for rail line bypasses. The City of Pierre then submitted a bypass proposal which would involve construction of approximately 14.6 miles of new rail line and a new bridge over Lake Sharpe (Missouri River) that would be approximately 1.5-miles in length. The proposed route would bypass both Pierre and Fort Pierre.

SEA evaluated the proposed bypass around the communities of Pierre and Fort Pierre in the Draft EIS (Chapter 2) and determined it to be infeasible. SEA determined that the proposed Pierre/Fort Pierre bypass would have significant environmental and engineering constraints, such as the need for extensive cut and fill to establish a safe and suitable grade for a new rail line, construction of a new 1.5-mile bridge over the Missouri River, that was much longer than the existing bridge, and severe impacts to a substantial amount of cultural resources.

Following release of the Draft EIS, SEA received numerous comments pertaining to the proposed Pierre/Fort Pierre bypass. These comments generally described the potential impacts related to rehabilitation of DM&E's existing rail line through these communities and, in particular, increased rail traffic to as many as 37 trains per day. Commenters also expressed concern that SEA had too quickly (or unfairly) eliminated the proposed bypass from further consideration in the Draft EIS. Numerous commenters urged SEA to reconsider the Pierre/Fort Pierre bypass. In response to the comments, SEA determined that it was appropriate to conduct further investigation of the potential environmental impacts associated with the Pierre/Fort Pierre bypass and to compare them to the impacts associated with rehabilitation and operation of the existing DM&E rail line. The results of SEA's additional investigation are set forth below.

As discussed in this Chapter, SEA reaffirms here its conclusion in the Draft EIS that the proposed Pierre bypass is not a reasonable and feasible alternative. Even though nearly all the commenters from Pierre and Fort Pierre indicated that a bypass was necessary, SEA's analysis simply cannot support the conclusion that the proposed bypass would be workable.

The proposed bypass would require building a new bridge across one of the widest points of the Missouri River. The bridge would be more than 1.5 miles in length, including approaches and abutments, and would permanently impact wetlands and result in significant erosion and sedimentation problems. Such sedimentation problems would adversely affect Lake Sharpe, which is already classified as an impaired water because of accumulated sediment. In contrast, rehabilitating the existing line could be accomplished with a bridge approximately one-fifth the length of the bypass bridge, and the bridge associated with rehabilitation of the existing line would be in a previously disturbed area. Therefore, the impacts and construction costs of the bypass bridge would be more severe and costly, \$43.6 million to \$75.1 million more than rehabilitation of the existing rail line and bridge.

DM&E has stated that extensive amounts of cut and fill would be required for the Pierre bypass. Pierre's original bypass submittal supports this, indicating that approximately 11 million cubic yards of earthwork would be required for the 14.3 miles.<sup>1</sup> In addition, the proposed Pierre bypass bridge would be located just downstream from Antelope Island in Lake Sharpe. There is strong evidence that large Native American villages were once present on the island and surrounding areas. Therefore, it is likely that large numbers of significant cultural resources are in the area, which would be adversely affected by construction. Although the impacts to these sites could be reduced through mitigation, mitigation could take years, would be extremely costly, and is considered an adverse impact under the National Historic Preservation Act and by the Native Americans.

SEA agrees with those that favor a bypass that upgrading DM&E's existing line through Pierre and Fort Pierre would cause substantial disruption to the citizens of Pierre and Fort Pierre and visitors to those communities. As South Dakota's State Capital, Pierre is a regional commercial center and large numbers of visitors attend conventions and meetings and consult with legislators in Pierre. State government has offices and facilities on both sides of DM&E's track, and the Governor of South Dakota has raised concerns about increased rail traffic through Pierre hindering access to state offices.

Furthermore, State Highway 34, a major east-west highway, crosses the railroad at an "S" curve at the location of one of the City's busiest intersections, where Sioux Avenue, East Wells Avenue, and Capital Avenue converge. Also, the rail line is located in close proximity to Pierre's only hospital. Finally, all of DM&E's projected coal trains leaving the PRB (as many as 17 per day) as well as those returning (as many as 17 per day) would pass through Pierre and Fort Pierre because there is no interchange point west of these communities.

---

<sup>1</sup> This amount of earthwork is substantial, considering DM&E estimates only approximately 17 million cubic yards of earthwork for the nearly 280 miles of new construction required for Alternative C (see Chapter 3).

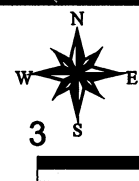
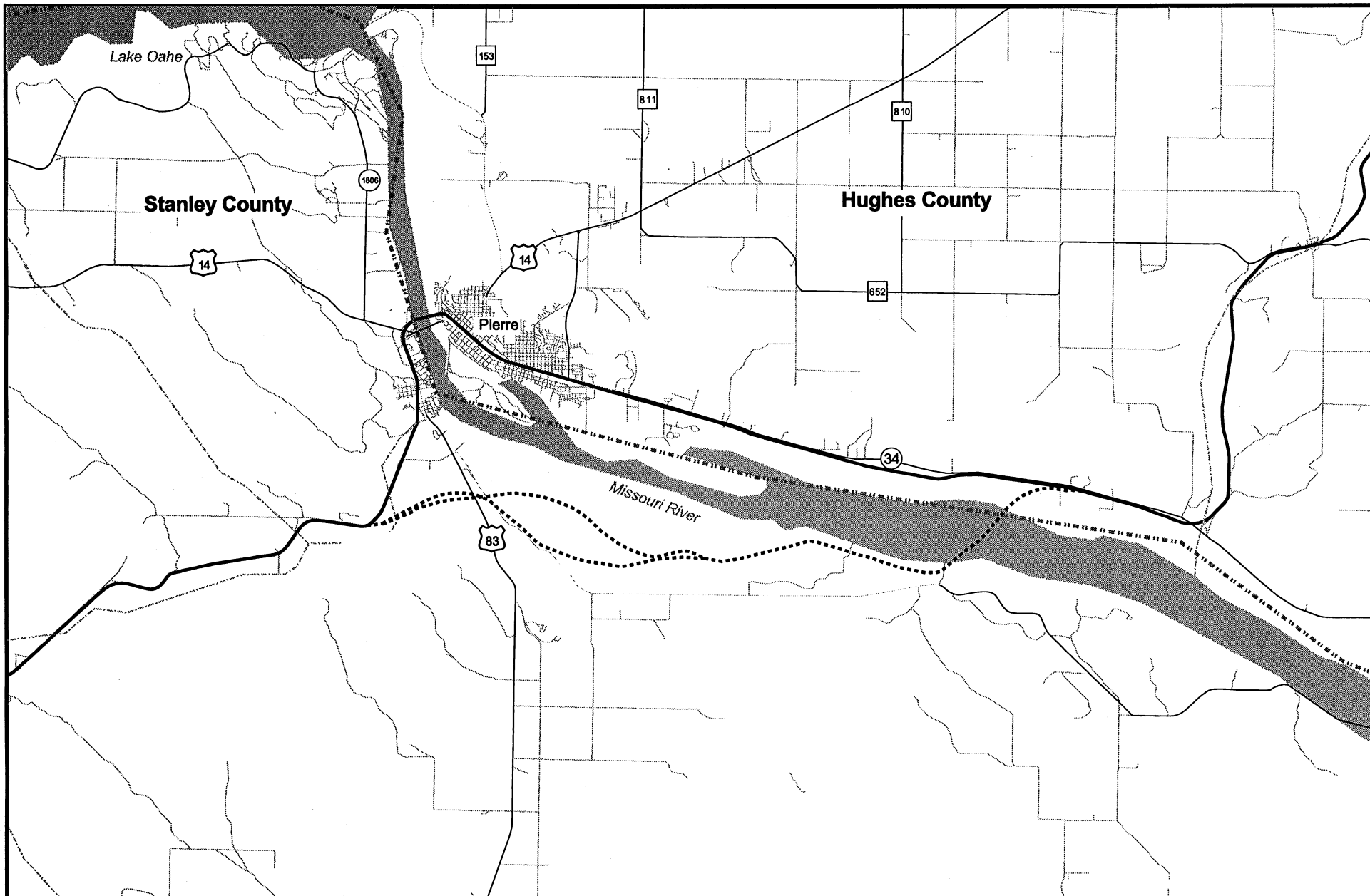
Based on all the problems with the bypass that has been proposed and the unique circumstances faced by Pierre, SEA is recommending, in Chapter 12, that if the Board approves Alternative P-2, it require DM&E to install a grade separated crossing in Pierre, at Sioux Avenue or another mutually acceptable location, to be completed within one year after DM&E transports more than 50 million tons of coal through Pierre annually. This is in addition to various other mitigation measures that SEA is recommending for Pierre, including improved grade crossing warning devices and noise mitigation (See Chapter 12). SEA believes that a grade separated crossing would significantly improve safety, facilitate emergency vehicle access, and minimize traffic distributions and noise for citizens and visitors to the State Capital if the Board approves Alternative P-2.

The City of Pierre has suggested that a grade separated crossing in Pierre may not be feasible due to the complexity of the project, disruption of existing traffic patterns during construction, and high cost. However, SEA conducted its own site visits and engineering review and concluded that a grade separation at Sioux Avenue could be accomplished by elevating a portion of Sioux Avenue over DM&E's existing rail line. SEA's engineers concluded that an elevation of Sioux Avenue could be accomplished assuming roughly a 4 percent grade following the same alignment as the existing road. Sufficient room exists to construct such a bridge without requiring removal of any businesses or structures around the rail/road intersection. The bridge could consist either of retaining walls and fills, with only the bridge crossing the rail line, which would affect traffic flow patterns and access to nearby businesses, or a portion of the avenue could be built on a bridge elevated with piers, which would allow realignment of existing access roads under the bridge to permit access to businesses. Some road realignment of Capital Avenue and East Wells Avenue could also be required. SEA has estimated the cost of constructing this crossing, together with the road realignments, to be approximately \$8-10 million. While not as far-reaching as a bypass would be, the grade separation appears to SEA to be feasible and the best available mitigation option, given the problems with the bypass that has been proposed.

This chapter describes the alternatives considered in the Pierre area, the potential impacts of the alternatives considered in the evaluation (Figure 5-1), and a comparison of impacts from each alternative. SEA's recommendation for the Pierre alternatives is provided at the end of the chapter.

## **5.1 ALTERNATIVES CONSIDERED**

Three alternatives have been evaluated by SEA for the Pierre/Fort Pierre area. These alternatives include the No-Action Alternative, and two Action Alternatives: rehabilitation of the existing rail line and construction of a bypass. The locations of these three alternatives are described below.




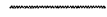

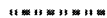
- |   |   |   |             |
|---|---|---|-------------|
|  | Existing Rail Line  |  | Roads       |
|  | New Construction  |  | County Line |
|   |  |   | Streams     |

Figure 5-1  
POWDER RIVER BASIN EXPANSION PROJECT  
Pierre/Fort Pierre Bypass Alternative Routes  
Pierre, South Dakota

### **Alternative P-1: No-Action**

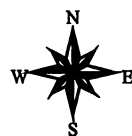
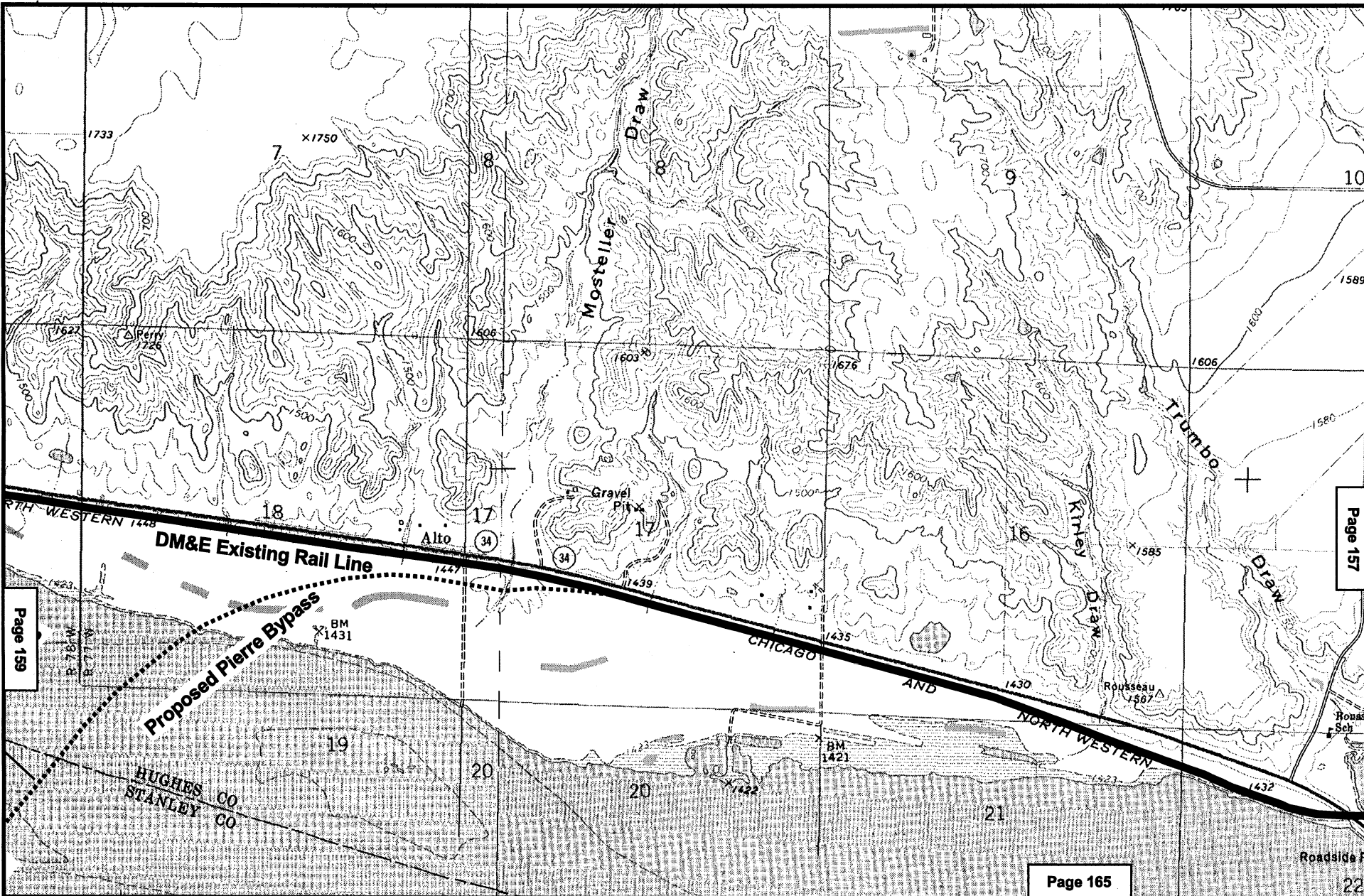
This alternative would entail denial of the total project. No new rail line construction or existing rail line reconstruction would occur. DM&E would not extend its existing system into the PRB. Under this alternative, DM&E would continue to operate under existing conditions, transporting only its existing rail traffic. No unit coal trains would be transported on the existing rail line. Wide-scale track improvements would not be made to the existing rail line. Current maintenance practices would continue as long as the track is in use. There would be no project-related costs associated with this Alternative.

### **Alternative P-2: Existing Rail Line**

Alternative P-2 involves the reconstruction of approximately 17.8 miles of existing DM&E rail line through Pierre and Fort Pierre (Figures 5-2 to 5-8). All DM&E train traffic, existing and future, would utilize this rail line. The existing rail line currently is in a deteriorated, although usable, condition. In order to support the amount of proposed train traffic at the proposed speeds, the tracks would have to be reconstructed in some areas, realigned in other areas, and improved throughout the system. Improvements to the rail line would also include the existing 0.3-mile long Missouri River Bridge. The bridge would either be reinforced to support the proposed increase in train traffic, or a similar bridge would be constructed adjacent to the existing bridge. Cost of this alternative would be approximately \$50.4 million. The cost of a new bridge structure, included in the \$50.4 million estimate, is estimated at \$14.2 million.

### **Alternative P-3: Pierre/Fort Pierre Bypass**

This alternative proposes to bypass all rail traffic around the cities of Pierre and Fort Pierre. The proposed bypass would be approximately 14.8 miles in length and extend around the south side of the cities, connecting with the existing rail line at either end (Figures 5-9 to 5-15). Two bypasses were proposed by the City of Pierre: Alignment A and Alignment B. Both alignments follow the same basic route, with one divergence south of Pierre. The bypass routes would leave the existing rail line in Hughes County west of Pierre, approximately 1.4 miles west of Kirley Draw (Figures 5-1 and 5-9). The new rail line would angle southwest, cross the Missouri River at Lake Sharpe east of Antelope Island, and then turn west in Stanley County. From this point, the line would cross U.S. Highway 83 approximately 3.4 miles south of Fort Pierre, cross the Bad River approximately 4.5 miles west of Highway 83, and converge with the existing rail line about 1.0 mile west of the Bad River crossing. All rail traffic, except that required to serve shippers in Pierre, would operate over the bypass. The estimated cost of this proposal is between \$94 and \$125.5 million. This includes construction of the new Missouri Bridge (see discussion below).



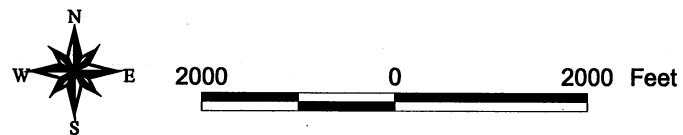
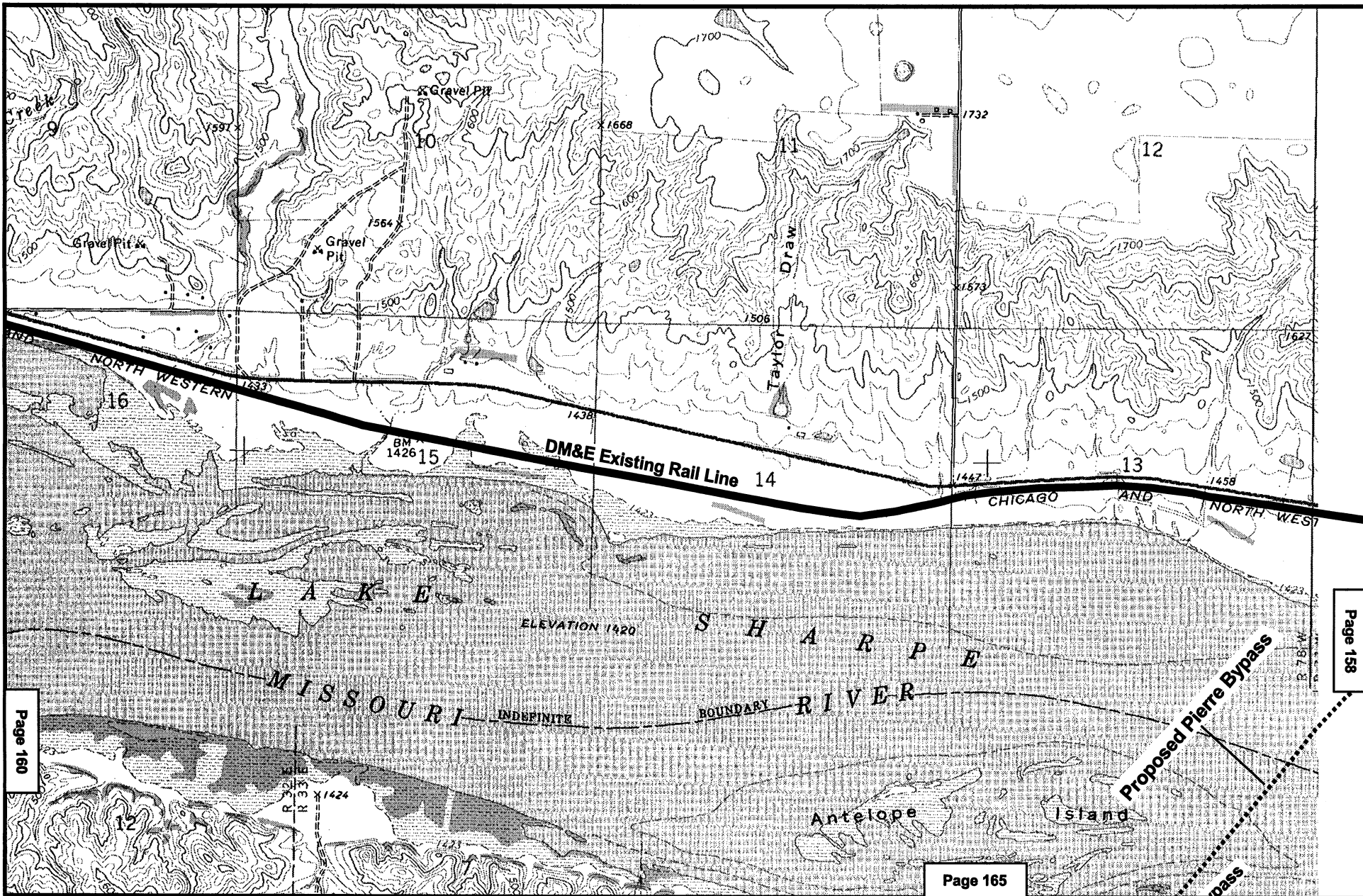
2000 0 2000 Feet

— Existing Rail Line  
 ..... Bypass Proposal

**Figure 5-2**  
**POWDER RIVER BASIN EXPANSION PROJECT**  
**EXISTING DM&E RAIL LINE\***  
**HUGHES COUNTY, SOUTH DAKOTA**  
**ANTELOPE ISLAND, ROUSSEAU QUADS**

\* Formerly Chicago and Northwestern Rail Line

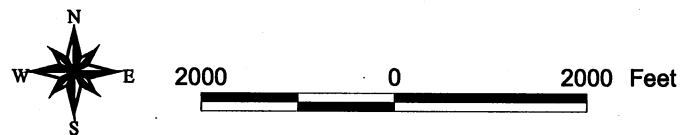
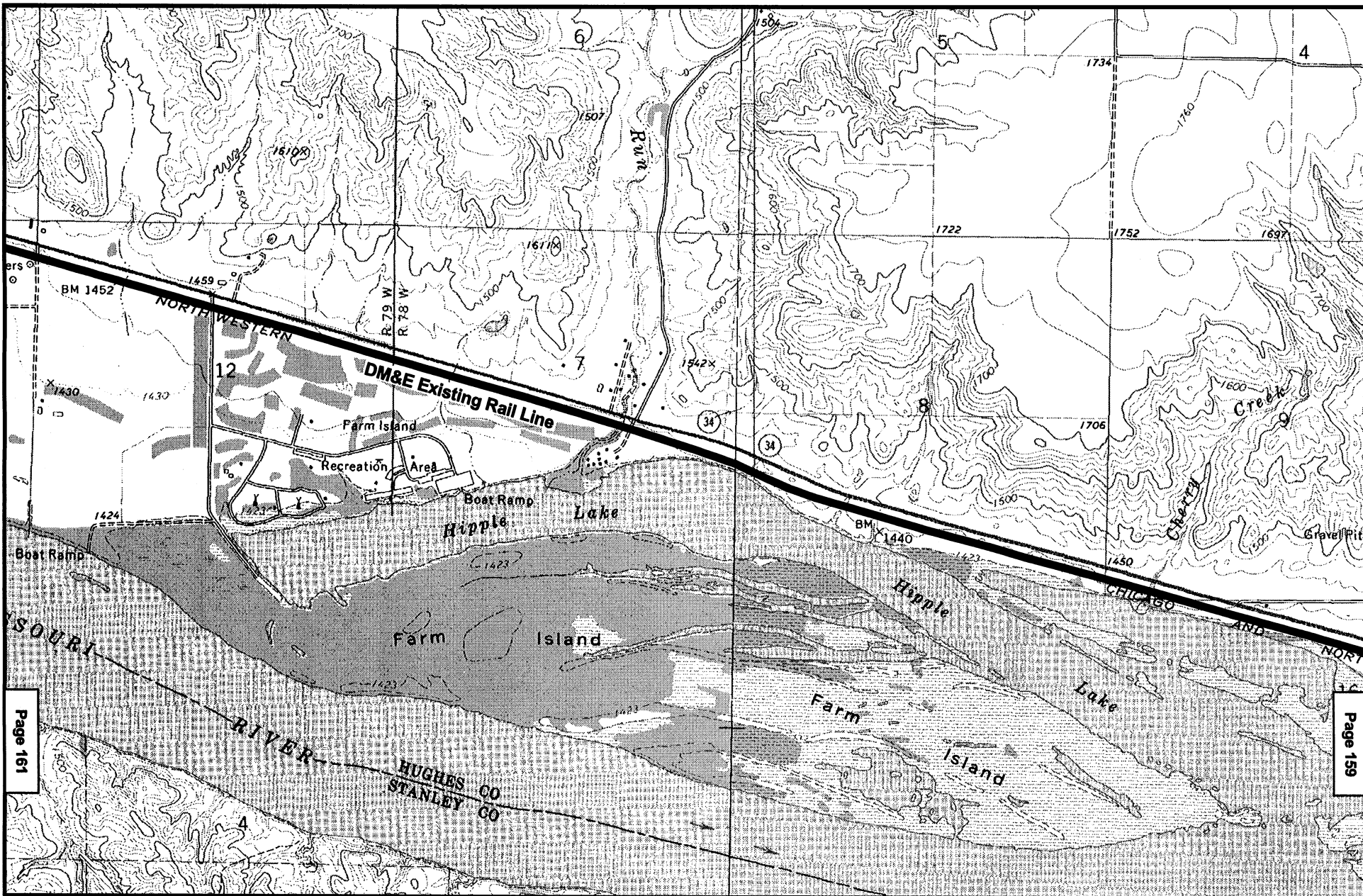




— Existing Rail Line  
 ..... Bypass Proposal

**Figure 5-3**  
**POWDER RIVER BASIN EXPANSION PROJECT**  
**PROPOSED PIERRE BYPASS**  
**HUGHES COUNTY, SOUTH DAKOTA**  
**ANTELOPE ISLAND QUAD**

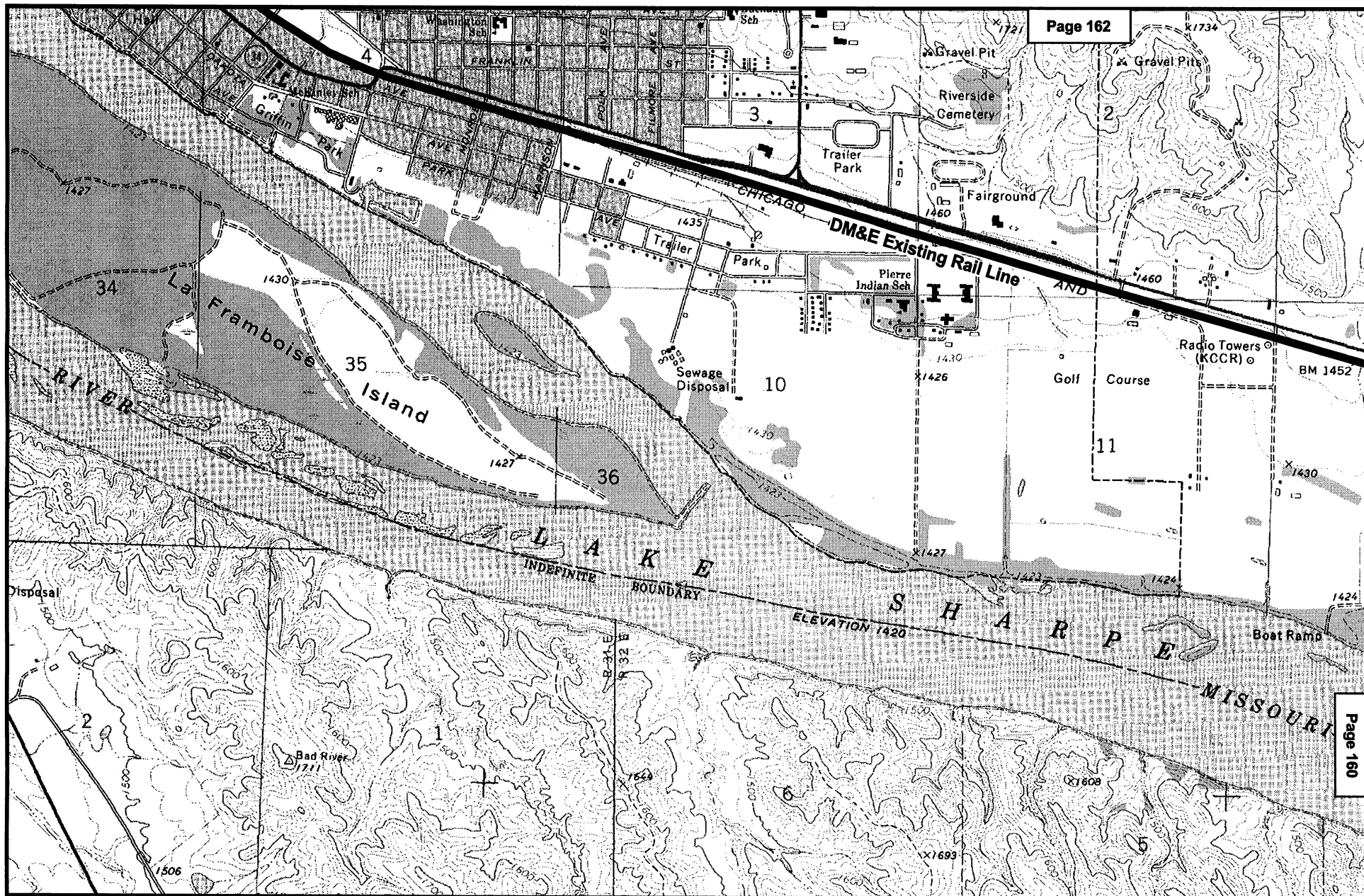
\* Formerly Chicago and Northwestern Rail Line



— Existing Rail Line  
 ..... Bypass Proposal

**Figure 5-4**  
**POWDER RIVER BASIN EXPANSION PROJECT**  
**EXISTING DM&E RAIL LINE\***  
**HUGHES COUNTY, SOUTH DAKOTA**  
**PIERRE, ANTELOPE ISLAND QUADS**

\* Formerly Chicago and Northwestern Rail Line



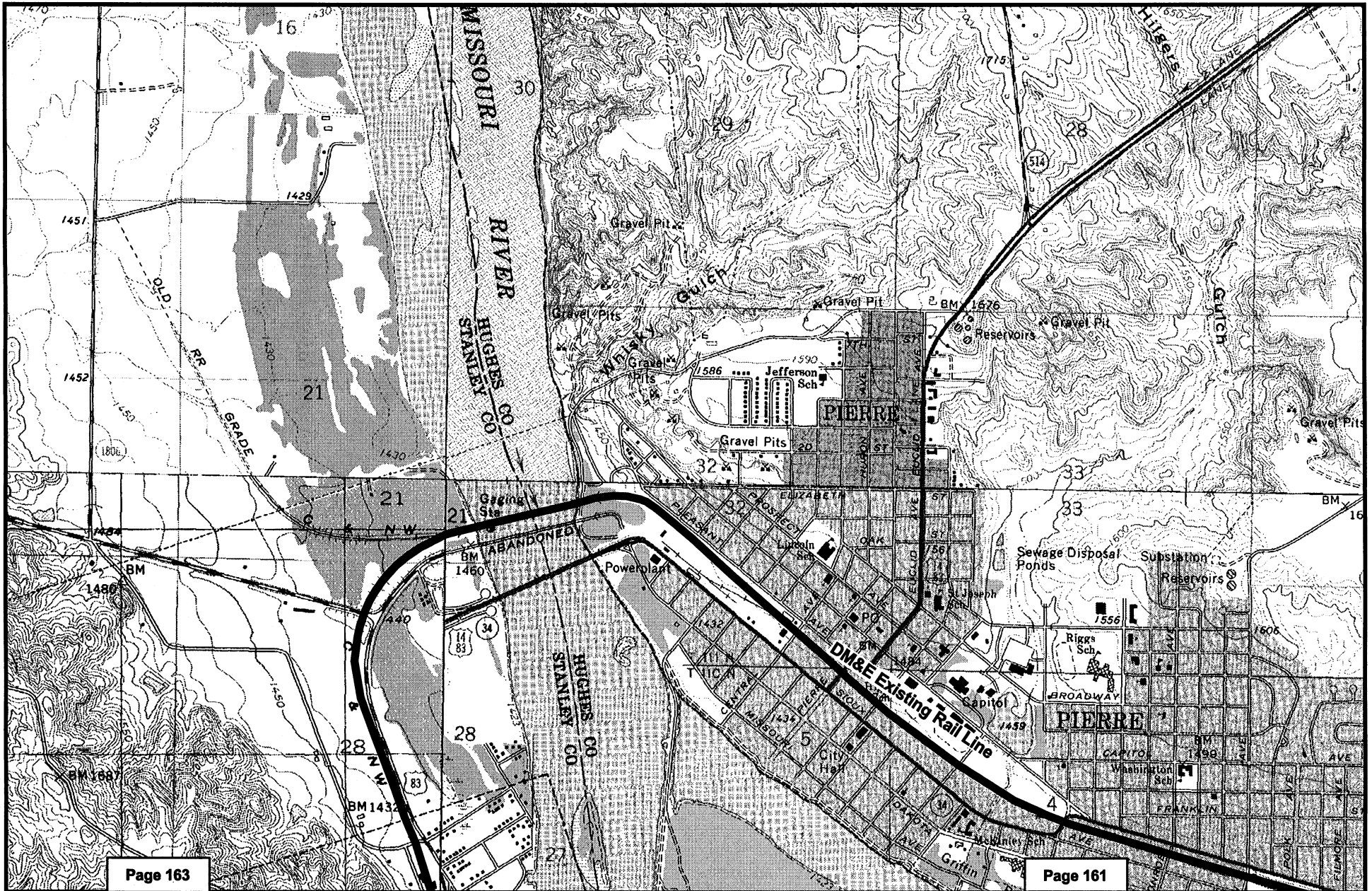
2000 0 2000 Feet

— Existing Rail Line  
 ..... Bypass Proposal

**Figure 5-5**  
**POWDER RIVER BASIN EXPANSION PROJECT**  
**EXISTING DM&E RAIL LINE\***  
**HUGHES COUNTY, SOUTH DAKOTA**  
**PIERRE QUAD**

\* Formerly Chicago and Northwestern Rail Line





Page 163

Page 161

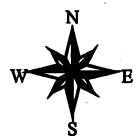
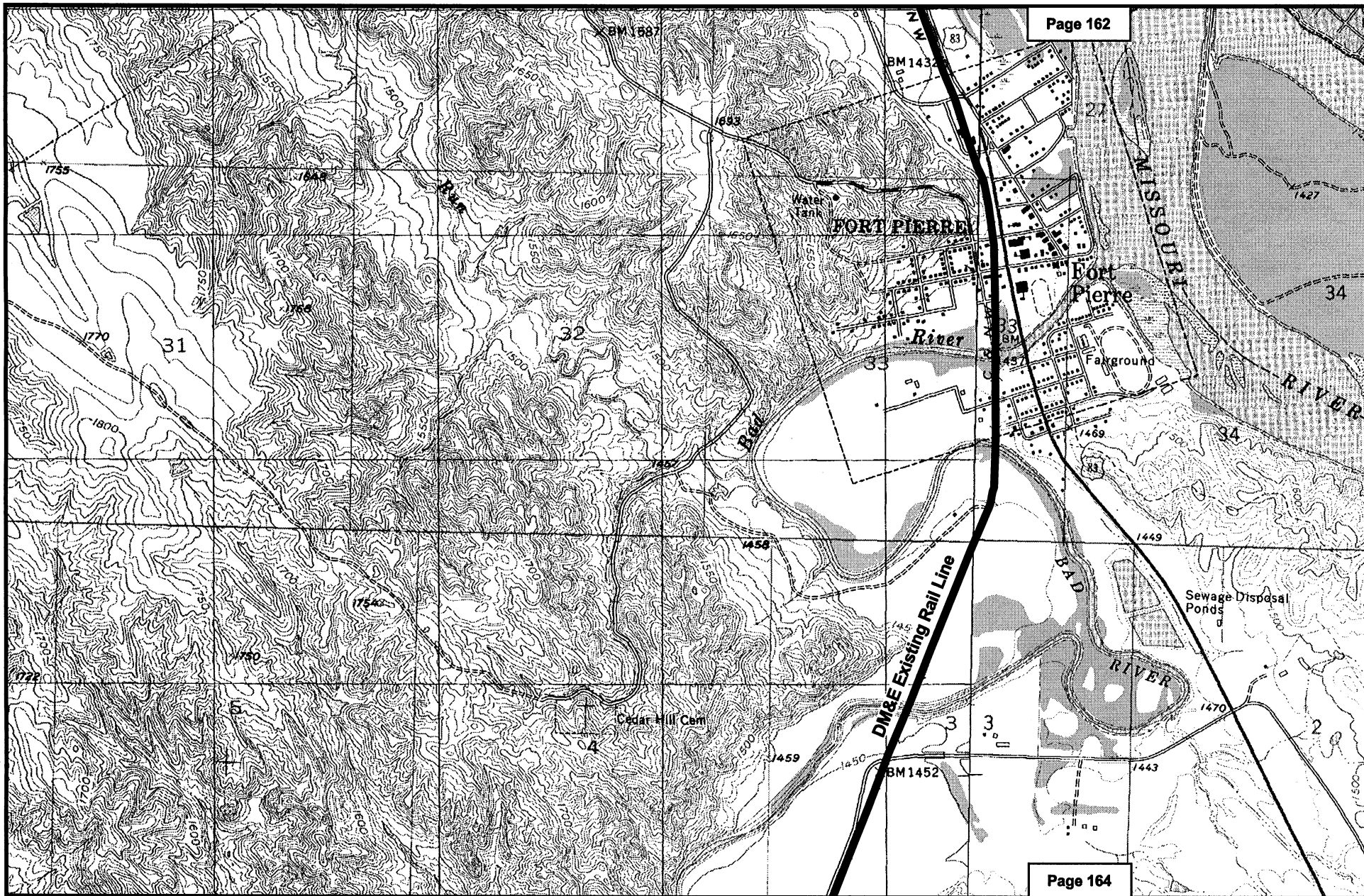


2000 0 2000 Feet

— Existing Rail Line  
 ..... Bypass Proposal

**Figure 5-6**  
**POWDER RIVER BASIN EXPANSION PROJECT**  
**EXISTING DM&E RAIL LINE\***  
**HUGHES AND STANLEY COUNTIES, SD**  
**OAHE DAM, PIERRE NE, PIERRE SW, PIERRE QUADS**

\* Formerly Chicago and Northwestern Rail Line

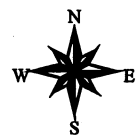
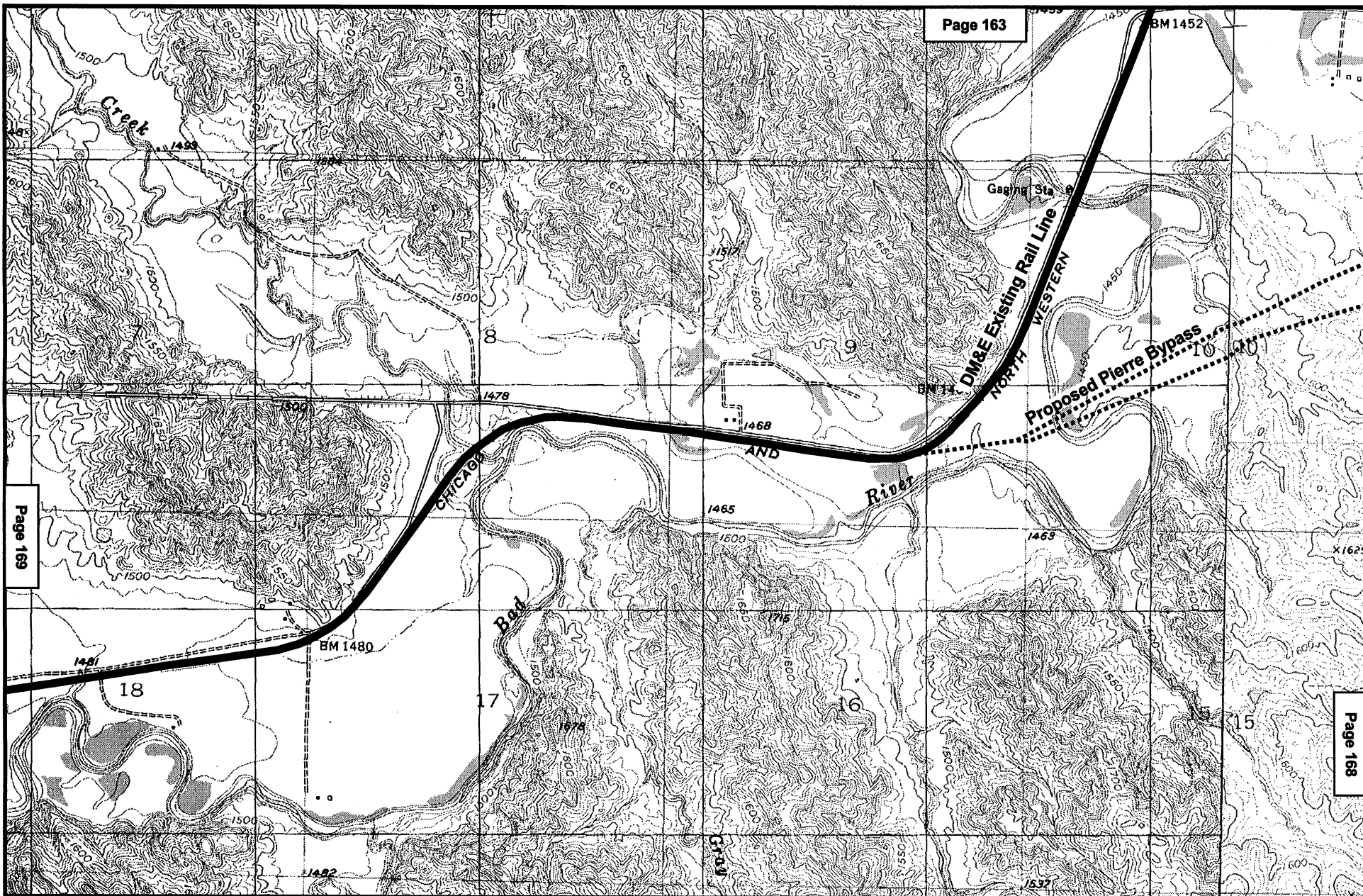


2000 0 2000 Feet

Existing Rail Line  
Bypass Proposal

Figure 5-7  
POWDER RIVER BASIN EXPANSION PROJECT  
EXISTING DM&E RAIL LINE\*  
STANLEY COUNTY, SOUTH DAKOTA  
PIERRE SW, PIERRE QUADS

\* Formerly Chicago and Northwestern Rail Line



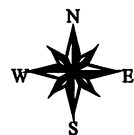
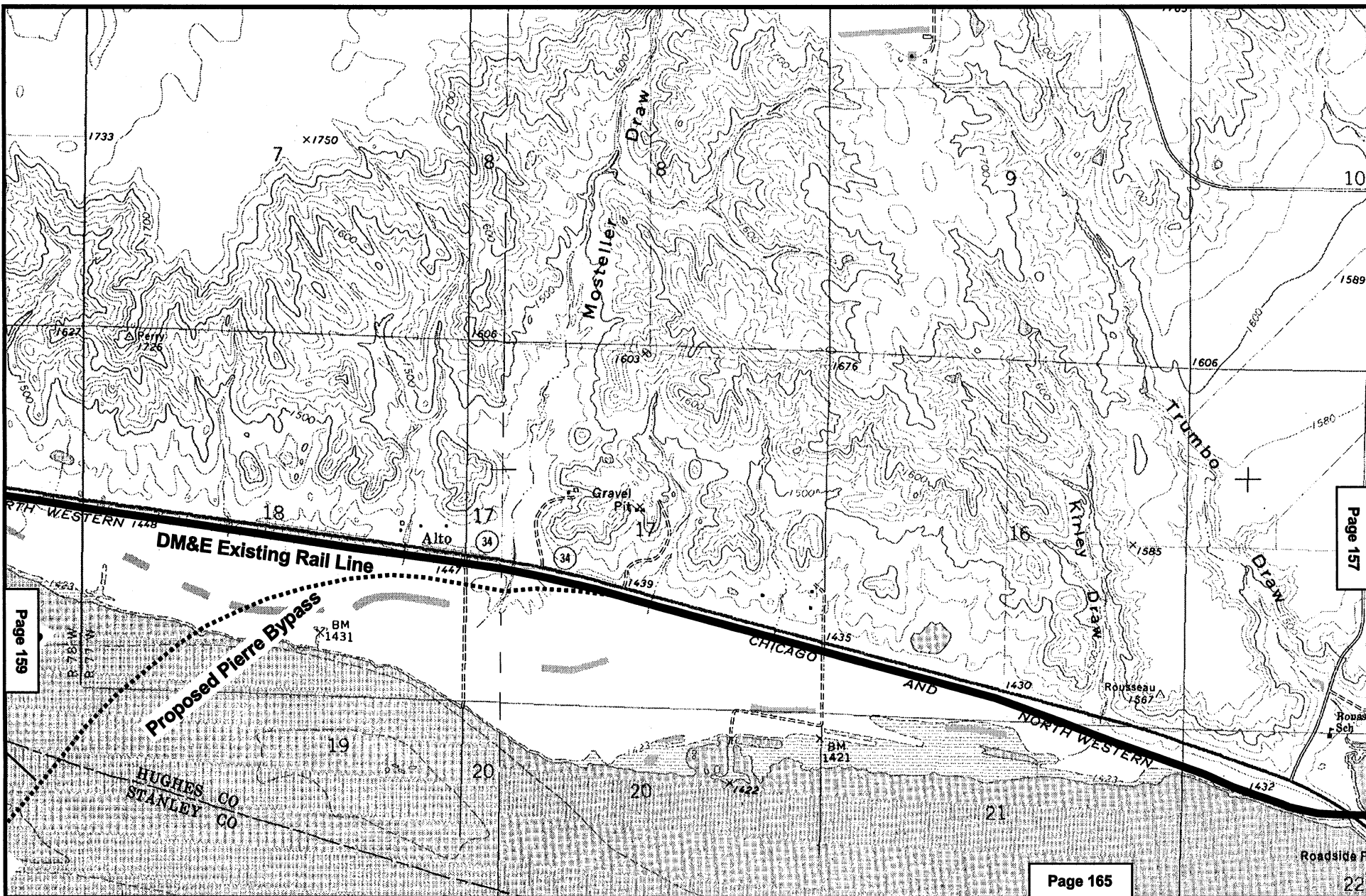
2000 0 2000 Feet

Existing Rail Line  
Bypass Proposal

**Figure 5-8**  
**POWDER RIVER BASIN EXPANSION PROJECT**  
**EXISTING DM&E RAIL LINE\***  
**STANLEY COUNTY, SOUTH DAKOTA**  
**PIERRE SW, PIERRE QUADS**

\* Formerly Chicago and Northwestern Rail Line



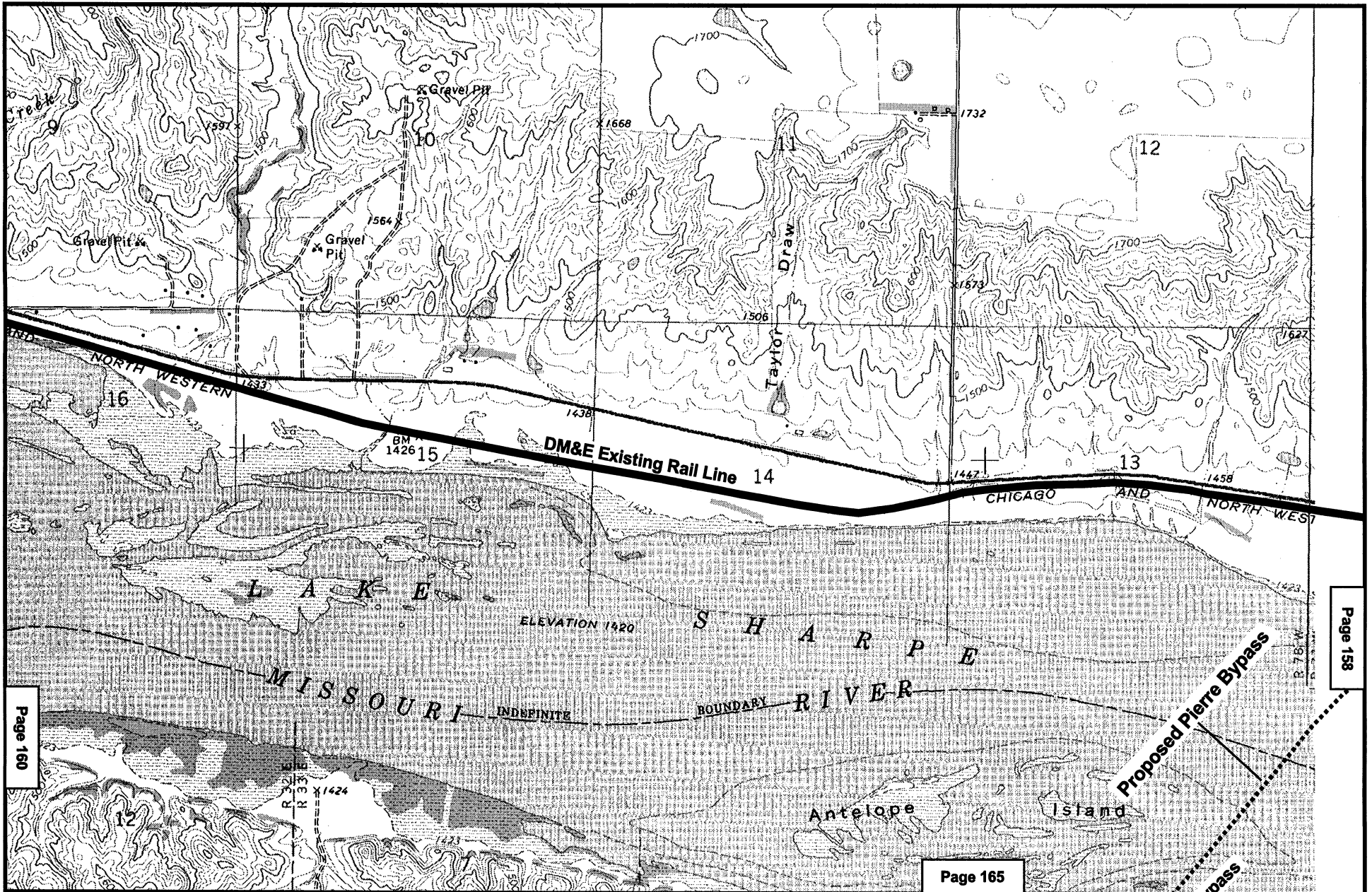


2000 0 2000 Feet

Existing Rail Line  
Bypass Proposal

**Figure 5-9**  
**POWDER RIVER BASIN EXPANSION PROJECT**  
**EXISTING DM&E RAIL LINE\***  
**HUGHES COUNTY, SOUTH DAKOTA**  
**ANTELOPE ISLAND, ROUSSEAU QUADS**

\* Formerly Chicago and Northwestern Rail Line



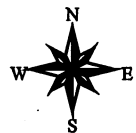
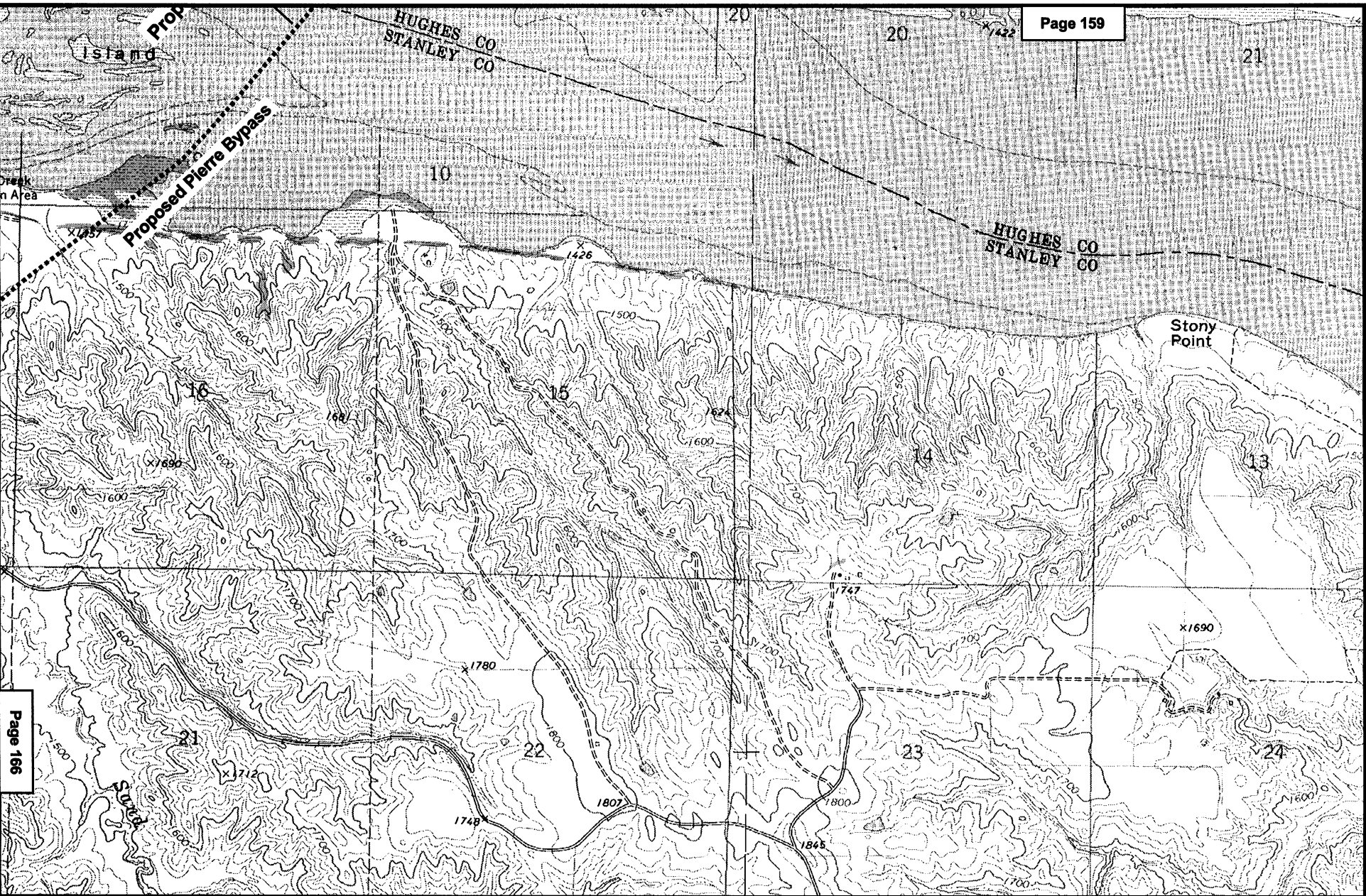
2000 0 2000 Feet

— Existing Rail Line  
 ..... Bypass Proposal

**Figure 5-10**  
**POWDER RIVER BASIN EXPANSION PROJECT**  
**PROPOSED PIERRE BYPASS**  
**HUGHES COUNTY, SOUTH DAKOTA**  
**ANTELOPE ISLAND QUAD**

\* Formerly Chicago and Northwestern Rail Line





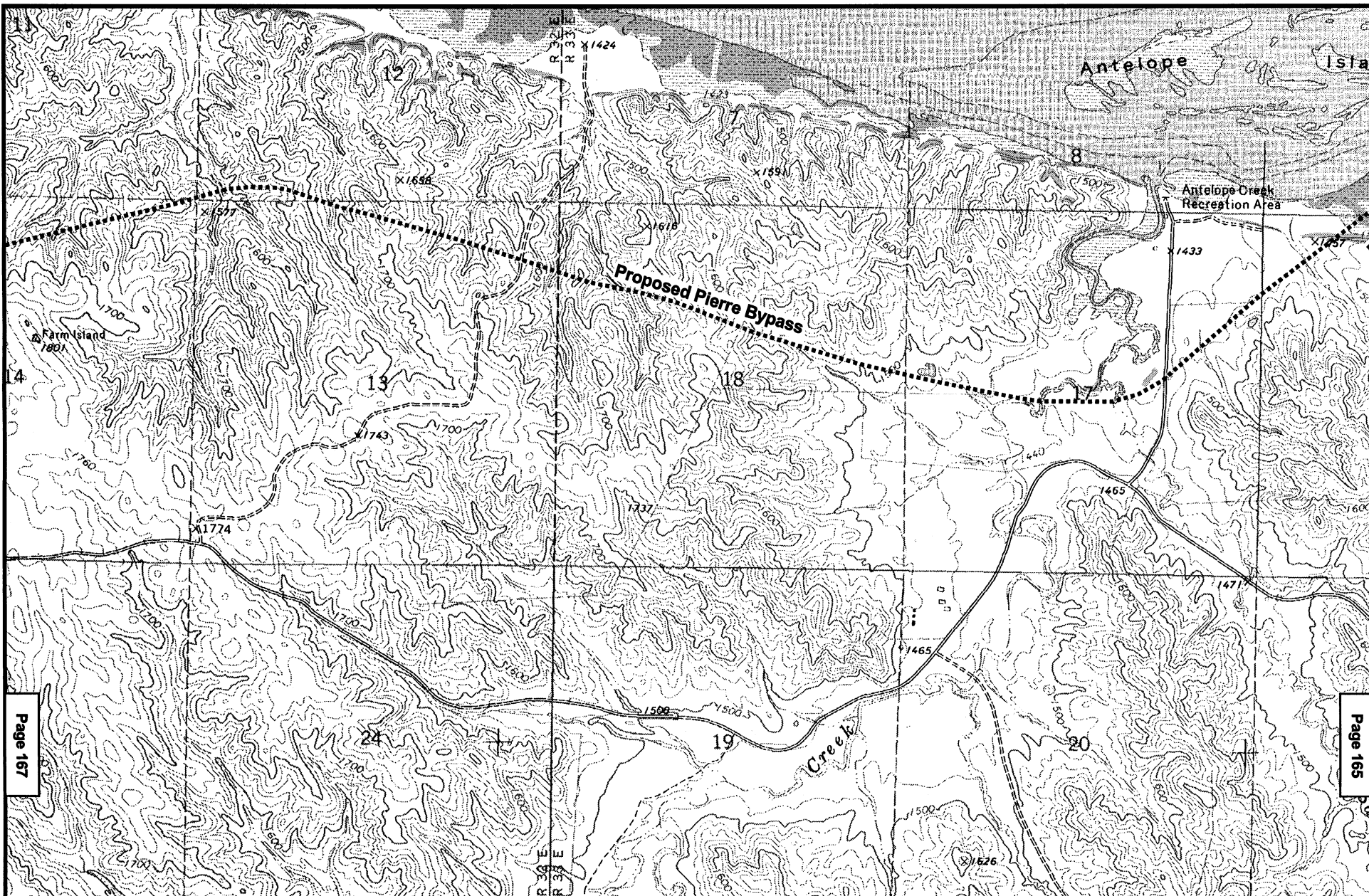
2000 0 2000 Feet



Existing Rail Line  
Bypass Proposal

**Figure 5-11**  
**POWDER RIVER BASIN EXPANSION PROJECT**  
**PROPOSED PIERRE BYPASS**  
**STANLEY COUNTY, SOUTH DAKOTA**  
**ANTELOPE ISLAND, ROUSSEAU QUADS**

\* Formerly Chicago and Northwestern Rail Line



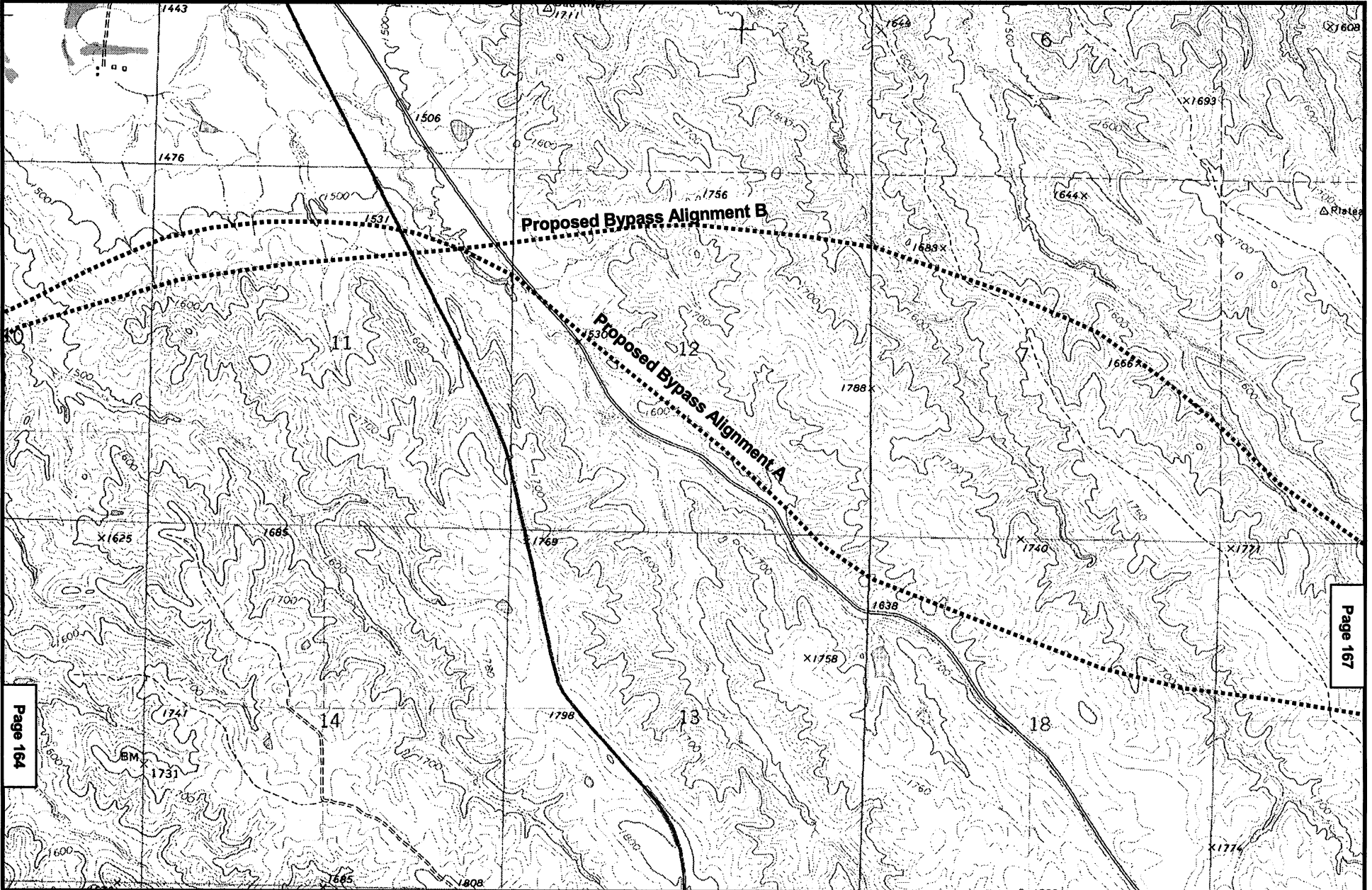
2000 0 2000 Feet

Existing Rail Line  
Bypass Proposal

**Figure 5-12**  
**POWDER RIVER BASIN EXPANSION PROJECT**  
**PROPOSED PIERRE BYPASS**  
**STANLEY COUNTY, SOUTH DAKOTA**  
**ANTELOPE ISLAND QUAD**

\* Formerly Chicago and Northwestern Rail Line

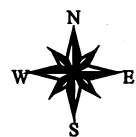
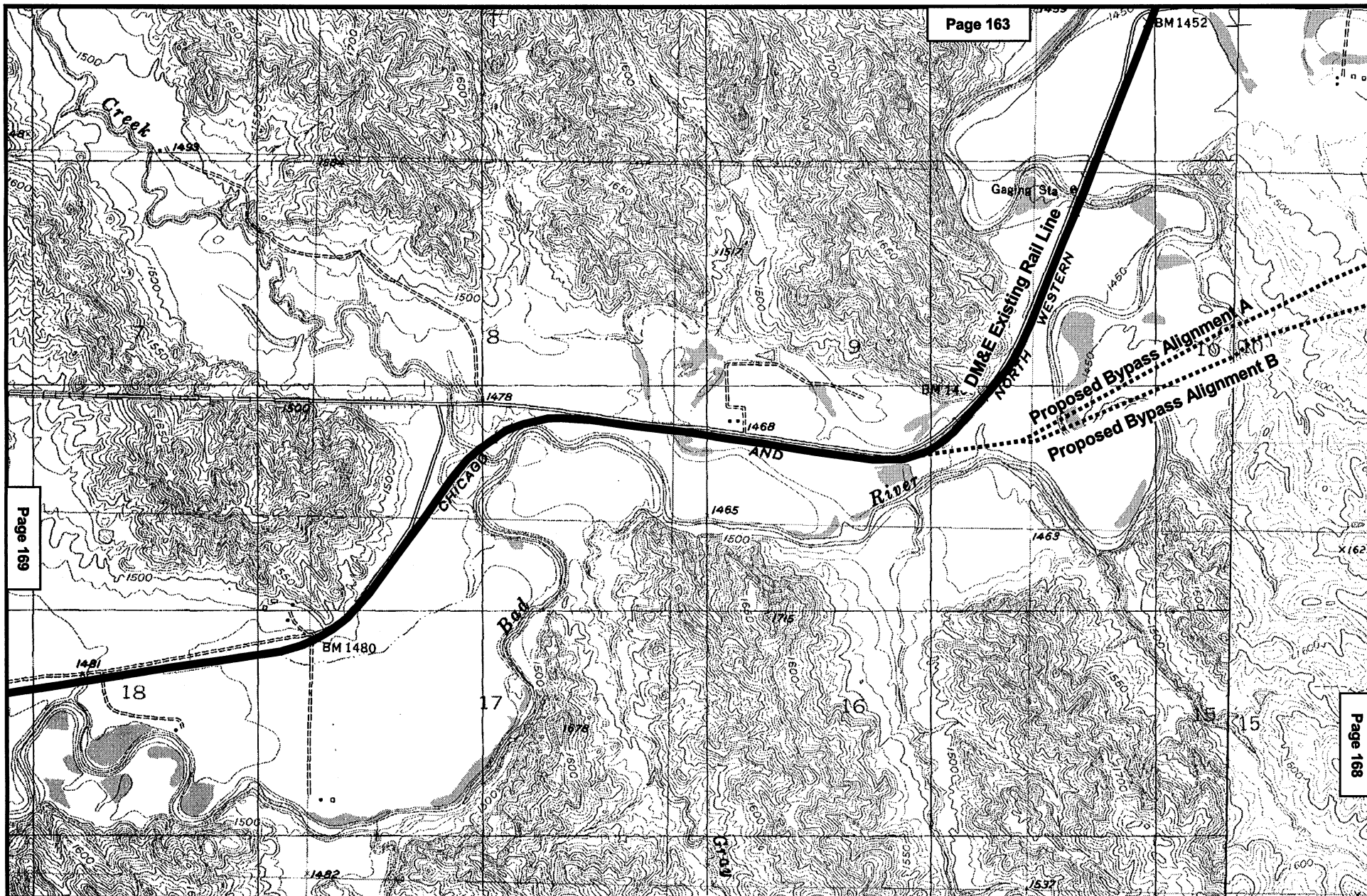




**Figure 5-14**  
**POWDER RIVER BASIN EXPANSION PROJECT**  
**PROPOSED PIERRE BYPASS**  
**STANLEY COUNTY, SOUTH DAKOTA**  
**PIERRE QUAD**

\* Formerly Chicago and Northwestern Rail Line





2000 0 2000 Feet

Existing Rail Line  
Bypass Proposal

**Figure 5-15**  
**POWDER RIVER BASIN EXPANSION PROJECT**  
**PROPOSED PIERRE BYPASS**  
**STANLEY COUNTY, SOUTH DAKOTA**  
**PIERRE SW, PIERRE QUADS**

\* Formerly Chicago and Northwestern Rail Line

On the west side of T4N, R32E, Section 15, two potential alignment options were proposed by Pierre and Fort Pierre. Alignment A would traverse west across Sections 16, 17, and 18, then turn northwest following an unnamed tributary of the Bad River through Section 12, T4N, R31E, curving west into Section 11 and cross U.S. Highway 83 with a grade separation. Alignment B would curve northward, pass through the north portion of Section 16, the northeast corner of Section 17, and follow an intermittent, unnamed tributary of the Missouri River through the southwest corner of Section 8 and into Section 7. In Section 7, the alignment would curve west across the northern portion of Section 12, T4N, R31E, into Section 11, and across U.S. Highway 83 with a grade separation.

After crossing the highway, both alignments would follow generally the same path southwest through Section 10. They would cross the Bad River in the southwest corner of Section 10 and then turn west to join with the existing DM&E rail line in Section 9, approximately 300 feet north of the river.

SEA chose Alignment A for detailed analysis because it is adjacent to the existing right-of-way along State Road 1806. Additionally, the terrain it crosses is less severe and would require less earth disturbing activity during construction than Alternative B. Alternative A seemed to provide a more realistic location to construct a rail line in this area and to minimize the potential environmental impacts of rail line construction and operation.

### **Missouri River Bridge**

Construction of a new Missouri River crossing, as proposed for Alternative P-3, would occur at Lake Sharpe. The bridge would span approximately one mile of water and, including approaches, would be more than 1.5 miles in total length. The existing bridge would no longer be used for rail traffic and DM&E could transfer ownership of the bridge to another party. The bridge could then be converted to other uses, such as a recreation trail or support for utilities. If ownership of the bridge were not transferred, DM&E would be required to remove the existing bridge according to Coast Guard regulations. The cost of a new bridge has been estimated to be \$35 million. This cost is reflected in the overall cost estimates for the bypass described above.

## **5.2 COMPARISON OF IMPACTS**

The following discusses the existing conditions and potential environmental impacts that could be anticipated to occur along the existing DM&E rail line for the No-Action and Action Alternatives (Alternative P-2 and Alternative P-3, Alignment A), as described above. The potential environmental impacts from construction and operation are included.

### **5.2.1 CLIMATE**

The climate in Stanley and Hughes counties, South Dakota is very seasonal. Summers are warm with frequent hot spells and occasional cool days. Winters are very cold with frequent surges of arctic air. Average daily maximum temperatures range from 89.0 degrees Fahrenheit (F) in July to 25.4 degrees F in January. Average daily minimum temperatures range from 61.3 degrees F in July to 4.8 degrees F in January. The majority of the rainfall occurs during the warm period and is usually most intense in spring and early summer. Winter snowfall is not usually heavy and tends to drift. Average precipitation ranges from 3.82 inches in June to 0.41 inches in January (Soil Conservation Service, 1980).

No impacts to the climate of the Pierre area are expected to occur as a result of the construction or operation of any of the alternatives.

### **5.2.2 TOPOGRAPHY**

The project area occurs in a region designated as the Missouri Plateau in the uplands and the Missouri River Trench along the Missouri River, both part of the Great Plains physiographic province. This region is characterized by gently undulating to rolling hills except near major waterways. Along the Bad River, topography tends to be hilly to steep, and the Missouri River has cut a trench two to four miles wide and 300 to 400 feet deep.

#### **Alternative P-1: No-Action**

No reconstruction or construction activities would result from this alternative. Nearly 100 years ago the topography was altered during construction of the original railroad, but no further alterations would result from this alternative.

#### **Alternative P-2: Existing Rail Line**

The reconstruction and operation of the existing rail line through the cities of Pierre and Fort Pierre would not likely have significant impacts to the topography of the project area. To accommodate the proposed increases in train speed on the rail line, some modification to the existing track would be required, including minor curve realignment, grade improvements, and either the reconstruction and/or realignment of the Missouri River bridge.

Impacts to topography resulting from this alternative would be minimized by confining construction activities to the existing right-of-way. Modification to the existing topography also would be kept to a minimum through the use of modern, rail mounted construction equipment.

### **Alternative P-3: Pierre/Fort Pierre Bypass**

Construction of the bypass would create changes in the topography of the area resulting from cut and fill operations designed to provide a suitable grade for operation of the proposed rail line. These changes could result in alteration of the drainage patterns in the area, especially in areas adjacent to cuts, floodplains, naturally wet areas, or areas where channelization and bank stabilization may be required at stream crossings. Impacts to topography resulting from this alternative could be minimized by restricting construction activities to the right-of-way. The bypass route could be adjusted as necessary to avoid severe impacts to topographical features, when curve and grade restrictions allow such changes.

### **5.2.3 GEOLOGY AND SOILS**

The geology in the Pierre area differs across the Missouri River. In Hughes County, east of the river, the geology is composed of Pleistocene deposits, specifically Illinoian Glacial sediments. These sediments were the result of glacial drift left behind about 2 million years ago. In Stanley County, west of the Missouri River, the geology is composed of Mesozoic formations, specifically Upper Cretaceous sediments. These sediments are comprised primarily of shale and chalk deposited during the Cretaceous time when South Dakota was covered by the continental seas. The majority of the geology in this area consists of shale, silt, sand, and gravel that ranges from 1 to 160 feet thick. Portions are also comprised of marl above calcareous siltstone.

Landslide deposits of slumped material consisting of glacial drift and Pierre shale occur along the southwest edge of the Missouri River. These areas are highly susceptible to landslides, especially along steep slopes and near drainages. As discussed in detail in Chapter 3, SEA determined that Pierre shale's susceptibility to landslides and slumping, and the difficulty it poses for construction are due to high shrink/swell potential and moderate to high content of clay in the formation. The Pierre shale formation contains layers of bentonite and other expandable materials, which absorb water and can expand or swell to many times its original size. As water drains from the formation, it shrinks as the layers of expandable material dry out and become compressed. During periods of drought, excessive shrinking can occur. Additionally, periods of high precipitation can result in excessive swelling. Over time, even minor shrinking and swelling can cause fracturing of rock material, resulting in slope instability, potentially leading to slumps or landslides.

For issues of shrink/swell potential and clay content, moisture is the primary concern. A constant and minimal moisture level needs to be maintained to minimize the potential for rock and soil materials to shrink or swell. Moisture needs to be kept away from high clay content areas to



prevent sliding of the rock layers within which they occur. These conditions make it even more important for good drainage to be maintained along the rail alignment.

The soils of the project area mostly are characterized as well drained and excessively drained, gently sloping to steep soils on uplands and terraces. The exception is where the proposed bypass diverges from the existing line to the east of Pierre, before crossing the Missouri River. Soils in this area tend to be silty and loamy soils found mostly in uplands.

The Draft EIS discussed the potential impacts of the project on soils in the area around Pierre. Potential impacts may include soil loss through erosion and handling, loss of prime farmland soils, and the introduction and establishment of noxious weeds from soil disturbance. Areas cleared of topsoil, denuded or disturbed during construction, would be more susceptible to erosion. Compaction caused by operation of construction equipment could make soils less permeable to water infiltration, thus reducing absorption and increasing water runoff volumes that would scour surface soils. Although the loss of prime farmland is unavoidable, mitigation measures to control erosion, prevent topsoil loss, and prevent invasion of noxious weeds can limit impacts to the construction and revegetation period. Chapter 4 of the Draft EIS discusses impacts to soil in more detail, and Chapter 12 of this Final EIS contains appropriate vegetation mitigation.

#### **Alternative P-1: No-Action**

No project-related impacts are expected to occur to the geology along the existing rail line as a result of this alternative. Soil impacts associated with the existing rail line, including removal of topsoil, mixing of soil profiles, and erosion, occurred about 100 years ago during its construction. However, continued operation of the rail line may cause minor localized soil disturbance resulting from general maintenance and use. There is also a minor potential for soil contamination from a derailment or accidental spill of fuel or hazardous materials.

#### **Alternative P-2: Existing Rail Line**

Only minimal additional excavation or soil disturbance would be necessary to reconstruct the existing rail line. Land disturbance occurred during initial rail line construction through the established rail corridor. Impacts to the geology of the area would not be expected. Soil impacts would be confined to the realignment of curves and road and water crossing upgrades. Operational disturbances would be the same as for the No-Action alternative, including the potential for soil contamination. However, the risk of a derailment is expected to be significantly reduced by the proposed rail line improvements.

Impacts to soil resources would be avoided and minimized by following best management practices, which would include erosion control measures such as the use of silt fences, minimizing disturbances to vegetation, and restricting vehicle traffic to designated areas and the rail line right-of-way, where necessary. Construction practices would also include development and implementation of an erosion and sedimentation control plan and a storm water pollution prevention plan (See SEA's recommended mitigation in Chapter 12).

### **Alternative P-3: Pierre/Fort Pierre Bypass**

The proposed bypass is not expected to have any significant impacts to the geology of the project area. However, cuts into the underlying rock would be required. In areas of Pierre shale, extra material might need to be excavated to provide stable sideslopes and adequate drainage. Increased excavation would result in wider cuts and greater disturbance to rock layers and soils along the alignment. Assuming a weighted shrinkage of approximately 18 percent, the study prepared for the City of Pierre estimated earthwork volume (amount of material from cut and fill activities) for the proposed bypass would be approximately 11,026,314 cubic yards (Banner Associates, Inc., 1999).

Commenters on the geology of the project area expressed concern that SEA had understated the potential problems associated with construction and operation of a new rail line across the Pierre shale formation. Commenters suggested that rail line construction across these formations would be difficult, if not impossible. Commenters indicated that if the rail line were constructed, the susceptibility of the formations to shrinking, swelling, and slumping (landslides) would pose an ongoing threat to rail bed stability and the safety of rail operations.

In response, SEA examined the issue in more detail to identify the underlying causes of the potential problems associated with crossing the Pierre shale. SEA determined that DM&E should be able, through extensive geotechnical investigation of the alignment prior to final design and construction, to identify those areas of Pierre shale along Alternative P-3 that would potentially pose a problem for rail line construction and operation. Once these areas were identified, design and engineering measures could be utilized to maintain the stability of the rail bed. Construction projects often must deal with a variety of geologic challenges. Moreover, rail lines and roadways occur throughout the project area and many of them cross Pierre shale. These facilities have continued to operate even though they cross challenging geologic areas. For these reasons, SEA believes that construction of Alternative P-3 would be possible, provided appropriate engineering and design measures were implemented to address areas of Pierre shale.

Soil disturbance would occur during construction of the bypass by impacting an area that is not currently used for railroad activities. The proposed route would impact approximately 359 acres of soil. Soil compaction could result from construction activities using heavy equipment and could decrease the productivity of those soils. Cut and fill operations could result in soil types being mixed. The removal of vegetation could increase erosion. Additionally, the numerous hills, steep drainages, and fills necessary to establish a suitable rail line grade, could expose soils to conditions likely to increase erosion. Impacts would generally be restricted to the proposed rail line right-of-way.

Slope steepness and drainage would require careful rail line design and construction consideration to help prevent landslides in areas that contain a high amount of shale. Slope ratios in these areas would likely have to be flatter than 3:1 and benching (stair-stepping) might be appropriate, increasing the amount of excavation. Springs would also need to be avoided because pooling water tends to initiate landslides. Extra drainage systems (e.g., drainage ditches, culverts, concrete-lined vs. natural ditches) would be necessary to remove water from the rail line and adjacent sideslopes to prevent it from accumulating and causing soils and rocks to slide.

Impacts to soil resources would be minimized by implementation of appropriate erosion control measures, prompt re-establishment of vegetation, and the confinement of construction activities to the rail line right-of-way, as described for Alternative P-2. Stabilization of sideslopes and fill areas through the use of wider excavations and fills and the installation of adequate drainage structures would help prevent landslides and slope slumping.

#### **5.2.4 PALEONTOLOGICAL RESOURCES**

Paleontological resources occur extensively in western South Dakota and may occur throughout the Pierre project area, primarily in gravel deposits and bedrock. As stated in Chapter 4 of the Draft EIS, these resources vary in age and fauna and consist of units that include mammals, reptiles, amphibians, birds, fish and numerous invertebrates, and plant species. Geologic formations are broadly categorized as Quaternary, Tertiary and Cretaceous.

##### **Alternative P-1: No-Action**

This alternative would not have project-related impacts on paleontological resources. Construction of the original rail line and facilities likely destroyed any such resources that occurred within the right-of-way. Operation and maintenance of the rail line is not expected to have further impacts.